

WHAT IS CLAIMED:

1. A condenser for a closed loop biomass extraction circuit, the condenser comprising a substantially closed vessel having a hollow interior including an upper portion and a lower portion, the hollow interior having secured therein one or more cooling members for condensing solvent, in vapour form, supplied to the hollow interior from an extractor of a biomass extraction circuit, the lower portion of the hollow interior being a reservoir, for condensed solvent, at or below at least one said cooling member, the reservoir including a liquid offtake for condensed solvent.
2. A condenser according to Claim 1, wherein the offtake includes a pipe including an in-line lute.
3. Apparatus according to Claim 2, including a siphon breaking line fluidically interconnecting the uppermost part of the lute and the upper portion of the hollow interior of the vessel.
4. Apparatus according to Claim 3, wherein the siphon breaking line includes a resistance to flow.
5. Apparatus according to Claim 2, wherein the lute includes one or more vertically extending pipe portions of a diameter large enough to permit vapour bubbles entrained in liquid flowing through the lute to rise in the lute and disengage therefrom.
6. Apparatus according to Claim 5, wherein the lute includes an outlet pipe portion, connectable to a biomass extraction vessel or a solvent circulation pump and connected to a said vertically extending pipe portion, the diameter of the outlet portion being less than the diameter of said vertically extending pipe portion, thereby ensuring that the outlet pipe portion remains full in use of the apparatus.

7. Apparatus according to Claim 1, wherein the liquid offtake includes a selectively operable drain for draining liquid from the reservoir.

8. Apparatus according to Claim 1, wherein the lower portion of the hollow interior includes a bottom wall that inclines downwardly towards the liquid offtake, whereby liquid condensate in the reservoir accumulates in the vicinity of the liquid offtake.

9. Apparatus according to Claim 2, wherein the depth of the lute, as defined by the vertical height of the uppermost part of the inverted lute, is adjustable.

10. Apparatus according to Claim 9 wherein the said depth is adjustable by lengthening or shortening of one or more length-adjustable, vertically extending pipes interconnecting the lowermost and uppermost parts of the inverted lute.

11. Apparatus according to Claim 9, wherein the lowermost and uppermost parts of the lute are interconnected by a flexible pipe and/or connector to facilitate adjustment of the depth.

12. Apparatus according to Claim 1, wherein the vessel includes a selectively operable vapour balancing vent for venting the upper portion of the hollow interior.

13. Apparatus according to Claim 2, including a modulating control line (41), having in-line an adjustable flow control valve (40), the modulating control line operatively interconnecting the liquid offtake from the reservoir (22b) and the outlet of the lute (30).

14. Apparatus according to Claim 13, including a temperature detector for generating a control signal in dependence on the temperature of liquid in the reservoir (22b), the adjustable flow control valve (40) being adjustable in dependence on the control signal.

15. Apparatus according to Claim 13, including a pressure detector for generating a control signal in dependence on the pressure of liquid in the reservoir (22b; 60), the adjustable flow

control valve (40) being adjustable in dependence on the control signal.

16. Apparatus according to Claim 13, when operated in conjunction with an evaporator for evaporating solvent supplied to the vessel, the apparatus including a detector of differential pressure between the interior of the evaporator and the hollow interior of the vessel, the detector generating a control signal in dependence thereon and the adjustable flow control valve (40) being adjustable in dependence on the control signal.

17. Apparatus according to Claim 1, wherein, in use, the level of liquid in the reservoir is controlled to be higher than at least part of a said cooling member, whereby the said cooling member cools liquid in the reservoir.

18. A method of operating a condenser for a closed loop biomass extraction circuit, the condenser comprising a substantially closed vessel having a hollow interior including an upper portion and a lower portion, the hollow interior having secured therein one or more cooling members for condensing solvent, in vapour form, supplied to the hollow interior from an extractor of a biomass extraction circuit, the lower portion of the hollow interior being a reservoir, for condensed solvent, at or below at least one said cooling member, the reservoir including a liquid offtake for condensed solvent, wherein the offtake includes an adjuster for adjusting the level of condensed solvent in the reservoir, the method including the step of selectively adjusting the said level while the condenser operates to condense vaporised solvent.

19. A method according to Claim 18, wherein the step of selectively adjusting the depth results in control of the level of the liquid in the reservoir.

20. A method according to Claim 18, wherein the step of selectively adjusting the depth results in control of the temperature of liquid in the reservoir.

21. A condenser – reservoir assembly for a closed loop biomass extraction circuit, the assembly comprising, operatively connected in series, an inlet to a heat exchanger (60), for solvent vapour from the heat exchanger, for liquid solvent;

a heat exchanger;

an outlet from the heat exchanger, for liquid solvent

a liquid reservoir connected to the outlet; and an outlet.

22. An assembly according to Claim 21, wherein an outlet from the reservoir is connected to the low point of the liquid lute, the low point lying generally below the heat exchanger.

23. An assembly according to Claim 21, wherein an inlet to the reservoir is connected to the low point of the liquid lute.

24. An assembly according to Claim 21, including a drain for draining the reservoir.

25. An assembly according to Claim 21, including a siphon breaking line fluidically interconnecting the high point of the liquid lute and the inlet to the heat exchanger.

26. An assembly according to Claim 25, wherein the siphon breaking line includes a resistance to flow.

27. An assembly according to Claim 21, wherein the heat exchanger is a plate heat exchanger.

28. An assembly according to Claim 21, wherein the lute includes one or more vertically extending pipe portions of a diameter large enough to permit vapour bubbles entrained in liquid flowing through the lute to rise in the lute and disengage therefrom.

29. An assembly according to Claim 28, wherein the lute includes an outlet pipe portion, connectable to a biomass extraction vessel or a solvent circulation pump and connected to a said vertically extending pipe portion, the diameter of the outlet portion being less the diameter of said vertically extending pipe portion, thereby ensuring that the outlet pipe portion remains full in use of the apparatus.

30. An assembly according to Claim 21, wherein the depth of the lute, as defined by the vertical height of the uppermost part of the inverted lute, is adjustable.

31. An assembly according to Claim 30, wherein the said is adjustable by lengthening or shortening of one or more length-adjustable, vertically extending pipes interconnecting the lowermost and uppermost parts of the inverted lute.

32. An assembly according to Claim 30, wherein the lowermost and uppermost parts of the lute are interconnected by a flexible pipe to facilitate adjustment of the said depth.

33. An assembly according to Claim 21, including a modulating control line, having an in-line adjustable control valve, the modulating control line operatively interconnecting an outlet from the reservoir and the outlet of the lute.

34. An assembly according to Claim 33, including a detector for detecting a variable in use of the apparatus and operating the adjustable flow control valve in dependence on the detected value of the variable.

35. An assembly according to Claim 34, wherein the variable is selected from:
the pressure of solvent vapour fed to the heat exchanger;
the temperature of fluid at a chosen location in the assembly;

29. An assembly according to Claim 28, wherein the lute includes an outlet pipe portion, connectable to a biomass extraction vessel or a solvent circulation pump and connected to a said vertically extending pipe portion, the diameter of the outlet portion being less the diameter of said vertically extending pipe portion, thereby ensuring that the outlet pipe portion remains full in use of the apparatus.

30. An assembly according to Claim 21, wherein the depth of the lute, as defined by the vertical height of the uppermost part of the inverted lute, is adjustable.

31. An assembly according to Claim 30, wherein the said is adjustable by lengthening or shortening of one or more length-adjustable, vertically extending pipes interconnecting the lowermost and uppermost parts of the inverted lute.

32. An assembly according to Claim 30, wherein the lowermost and uppermost parts of the lute are interconnected by a flexible pipe to facilitate adjustment of the said depth.

33. An assembly according to Claim 21, including a modulating control line, having an in-line adjustable control valve, the modulating control line operatively interconnecting an outlet from the reservoir and the outlet of the lute.

34. An assembly according to Claim 33, including a detector for detecting a variable in use of the apparatus and operating the adjustable flow control valve in dependence on the detected value of the variable.

35. An assembly according to Claim 34, wherein the variable is selected from:
the pressure of solvent vapour fed to the heat exchanger;
the temperature of fluid at a chosen location in the assembly;